

CNC Horizontal Boring and Milling Machine

Model: TK110A-4P



(Photo for reference, TK110A-4P with facing head)

Spindle diameter: $\Phi 110\text{mm}$;

Worktable size: 1250X1400mm;

Worktable travel (X): 1800mm;

Headstock vertical travel (Y): 1600mm;

Worktable longitudinal travel (Z): 1400mm;

Spindle axial travel (W): 600mm;

Main Features

1. TK110A-4P CNC Horizontal Boring and Milling Machine

- 1.1. CNC horizontal boring and milling machine TK110A-4P adopts the current advanced optical, mechanical, electrical, pneumatic, hydraulic and other new technologies to design and manufacture. Use FANUC 0i CNC system to realize four-axis simultaneous control, with excellent performance, wide processing range and high production efficiency.
- 1.2. TK110A-4P is bed table layout with good overall rigidity. The distance from spindle zero position to the end face of table is 25 mm, workpiece can be processed by spindle minimum overhang. No column movement error and column overturning by adopts fixed column structure which is beneficial to improve the machining precision.
- 1.3. Drilling, reaming, boring, groove cutting and plane milling can be completed by one time clamping; bevel, frame plane, large hole end face, two-dimensional, three-dimensional curved surface and internal and external threads can be milled by contour control method. The end of the spindle box is equipped with a fixed flat rotating disk device, which realizes the processing of larger planes, inner holes, outer circles, end faces and grooves.
- 1.4. The machine has the advantages of good rigidity, high precision, convenient operation, safety, reliability and beautiful appearance, is engineering machinery, rolling stock, mining equipment, large motors, water turbines, steam turbines, ships, iron and steel, military, nuclear power, environmental protection and other machinery processing equipment preferred processing areas.

2. Main specification

	Model	TK110A-4P	Units
Spindle head	Boring spindle diameter	110	mm
	Spindle taper	7:24 ISO 50	-
	Tool shak	BT50	-
	Pull stud	P50T-I	-
	Spindle speed	10-1500	r/min
	Main motor power	15	kW
	Spindle max torque	1029	Nm
	Min distance from spindle center to table surface	0	mm
	Spindle max drilling hole diameter	65	mm
	Spindle max boring hole diameter	300	mm
Facing head	Facing head diameter	670	mm
	Facing head rotation speed	7-165	r/min
	Max boring hole diameter of facing head	700	mm
Table	Table dimension	1250x1400	mm
	Max loading capacity	5000	kg
Machine travel	Table cross travel X	1800	mm
	Spindle head vertical travel Y	1600	mm
	Table longitude travel Z	1400	mm
	Spindle axial travel W	600	mm
	Facing head slide travel U	200	mm
Feed speed range	X/Y/Z	2.5-5000	mm/min
	W	2.5-3000	
	U	1-500	mm/min
	B	0.003-1	r/min
Rapid	X/Y/Z	5000	mm/min
	W	3000	mm/min
	U	1000	mm/min
	B	2	r/min
Positioning accuracy	X/Y/Z	0.018	mm
	W/U	0.025	mm
	B	8	"
Repeatability	X/Y/Z	0.012	mm
	W/U	0.020	mm
	B	6	"
Overall power	--	65	kVA
Machine dimension	LxWxH (About)	6530x4800x4400	mm
Machine weight	Net weight about	21000	kg

3. Main structure features

3.1. Machine layout

Machine is whole bed with fixed column, hanging side spindle head and cross sliding table structure. Spindle rotation is main movement.

Movement coordinate as follows

X-- Table cross movement

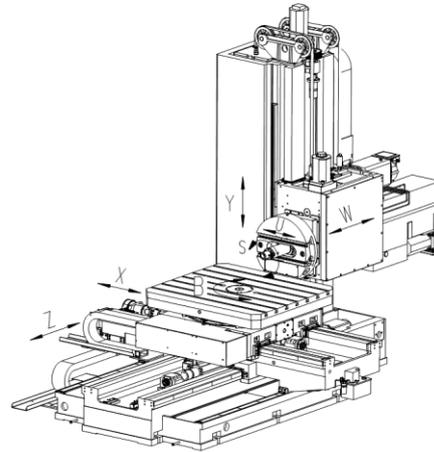
Y--Vertical travel of spindle head

Z--Table longitude movement

W--Boring spindle axial movement

B--Table rotation

U--Facing head slide travel



3.2. Basic parts

Bed, column, spindle head, table, carriage slide, tail and other large pieces of material for high-quality cast iron through aging treatment. FEM optimization design guarantees the machine rigid. Bed is a closed box structure (the main/guide rail of the bed is cast in one piece) with reasonable arrangement of reinforcing ribs and multi-support. The column adopts rectangular cross-section structure with internal reinforcement like honeycomb. Table is boxy shape structure with inner rib to get high loading capacity.

3.3. Machine guideway

4 guideway composed Z axis guideway structure, 2 main guideways are wide rectangular guideway, 2 rolling auxiliary guideway with steel inserts to ensure the accuracy of the X direction stroke at both ends.

The column guideway is made of two wide rectangular guideway and the side of the rear guideway is made of rolling guideway with steel inserts.

Down carriage's up guideway is rectangular guideway with roller insert at side.

X, Y, Z guide rail and 90 degrees of the main surface for paste plastic sliding guide pair. B axis is using circular sliding guide pair. W axis adopts stick plastic slide guide.

3.4. Spindle head

3.4.1. Spindle head structure

The spindle head is made of high quality cast iron through aging treatment. The spindle head body adopts box structure with reasonable arrangement of reinforcing ribs. The front face of spindle head is equipped with fixed facing head, which is suitable for processing large-size parts and enlarging the range of parts processing.

3.4.2. Spindle system

The main spindle adopts three-layer structure: facing head spindle, hollow spindle and boring spindle. Facing head bearing use taper roller bearing and spindle use imported bearing with good rotation accuracy and rigid. Spindle tool clamp realized by the disk spring and hydraulic automatic loose structure. Spindle material is made of 38CrMoA1A steel which has been remelted by electroslag remelting. After more than 30 processes, the surface hardness of the boring spindle is HV900.

3.4.3.Main drive system

Spindle rotary motion (SP axis) adopts AC servo spindle motor to drive the main gearbox with two gear shifts then to the hollow spindle by the gear pair of the main gearbox, and the hollow spindle is connected by keys to drive the boring spindle to realize the spindle rotary motion. Main gearbox gears are hydraulic shift with wide speed change range, high spindle speed, high output torque.

Facing head and spindle rotation movement through the hydraulic cylinder to achieve, flat rotating disk and spindle at the same time and at the same speed.

3.4.4 Spindle head balancing

Heavy balancing weight with the guiding device install inside of column to ensure the spindle box moving up and down smoothly.

Feed mechanism

3.5.1.Liner axes

The linear feed of X, Y, Z and W axes is driven by imported servo motor, decelerated by synchronous toothed belt wheel, and driven by preloaded ball screw to realize stepless speed regulation.

U axis liner feed adopts the servo motor deceleration to drive the preload ball screw rod to realize the facing head slide radial feed motion.

3.5.2.Rotary axis

B axis is driven by the servo motor after decelerating through the gearbox to drive the floating pinion and drive the big gear ring of the worktable to realize rotary feed. Floating pinion automatically compensates gear clearance, high transmission accuracy, stable and reliable.

3.6.Guideway protection

The Z axis and X axis are protected by a steel telescopic shield, the front end of the Y axis is protected by a metal armor shield and the back end is protected by an elastic leather cavity.

3.7.Clamp device

B axis is hydraulic clamp,Y axis use brake motor.

3.8.Hydraulic system

Independent hydraulic station supplies the oil which can realize the hydraulic loose of tool and main gear box high low speed shift, table clamp. The installation dimensions of the hydraulic system and the pipe fittings accord with the international standard.

3.9. Chip conveyor

The chip conveyor system is equipped with a spiral chip conveyor, which is fixed to the inner cavity of the bed, and there are chip conveyor windows on the main rail protection and auxiliary rails.

3.10. Cooling system

3.10.1. Cutting

The spindle cooling is provided by an oil cooler, which is connected to the oil block on the top of the spindle head through a high-pressure oil pipe for centralized distribution. It is mainly used for cooling and lubricating the spindle and each transmission shaft bearing and gear pair.

The front bearing of the spindle adopts grease lubrication, and the rear bearing of the spindle, the main transmission gear pair in the main shaft box, and the supporting bearing adopt an oil cooler for centralized oil supply and circulating lubrication.

3.10.2. Spindle cooling and lubrication

Spindle cooled by the oil chiller through high pressure oil pipe connected to oil distributor on spindle head top. The oil chiller oil is mainly used for cooling and lubrication of main shaft and transmission shaft bearings and gear pairs.

The front bearing of the spindle is lubricated by grease, the rear bearing of spindle, the main transmission gear pair in the headstock and the supporting bearings are lubricated by oil chiller

3.11. Pneumatic system

X, Y, Z axis linear grating scales with air blowing device.

3.12. Lubrication system

X axis, Y axis, Z axis and B axis guideway and lead screw are lubricated by timing and quantitative lubrication pump which is stable and reliable.

3.13. Operation

3.13.1. MPG

MPG unit is through a simple selection of coarse adjustment, medium adjustment and fine adjustment of feed control, to achieve rapid, high-precision feed and moving positioning.

3.13.2. Operation box

The operation box is suspended on the top of the electric cabinet, which can rotate and move, and the operation

is convenient and reliable

3.13.3. Emergency stop button and other operation button

The side of the column protection is equipped with the tool clamp and loose button and the emergency stop button, which is convenient for the single operator to conduct the tool clamp and loose operation and the emergency stop of the machine.

4. Feedback system

X, Y, Z liner grating scales full loop control

W, U is motor build-in encoder semi loop control

Spindle (SP axis) using encoder indirect measurement

Table is full loop control with circular grating scale.

5. Protection method

No	Function
1	Protection of lubricating oil shortage
2	Spindle drive failure
3	Spindle system overload
4	Interlock protection between spindle automatic tool unloader and spindle starting
5	Limit protection
6	Feed drive failure
7	Feed overload

6. Machine manufacturing and inspection standards

Standard	Items
GB/T 9061-2006	General technical requirements for metal cutting machine tools
GB 15760-2004	General technical requirements for safety protection of metal cutting machine tools
GB 5226.1-2008	Safety of machinery Electrical equipment of machinery Part 1: General technical conditions
GB/T 25376-2010	General technical requirements for machined parts of metal cutting machine tools
GB/T 23570-2009	Metal cutting machine tools General technical requirements for welded parts
GB/T 25373-2010	General technical requirements for assembly of metal cutting machine tools
GB/T 23571-2009	Preparation of random technical documents for metal cutting machine tools

GB/T 25375-2010	Metal cutting machine tool inspection and evaluation of bonding surface coloring method
GB/T 23572-2009	Metal cutting machine tools General technical requirements for hydraulic systems
JB/T 4241.4-2006	Horizontal milling and boring machine Part 4: Technical conditions
GB/T 5289.1-2008	Accuracy inspection conditions for horizontal milling and boring machines Part 1: Fixed column and movable table machine tools

7. CNC system

FANUC 0i system with AC servo feed and AC spindle drive system

7.1. Control axes

- 7.1.1 Control axes: 6 axes
- 7.1.2 Simultaneously control: 4 axes
- 7.1.3 English/metric conversion
- 7.1.4 Interlock (all axes/each axis / directions/section start/cutting section start)
- 7.1.5 Mechanical locking
- 7.1.6 Emergency stop
- 7.1.7 Overall travel
- 7.1.8 Location tracking
- 7.1.9 Servo off
- 7.1.10 Abnormal load detection

7.2. Run operation

- 7.2.1 Automatic operation (storage)
- 7.2.2 MDI
- 7.2.3 DNC
- 7.2.4 Program number retrieval
- 7.2.5 Sequential number retrieval
- 7.2.6 Program restart
- 7.2.7 Blank run
- 7.2.8 Single program block
- 7.2.9 JOG
- 7.2.10 Manually return to reference point

7.2 Interpolation

- 7.2.1 Positioning
- 7.2.2 One-way positioning
- 7.2.3 Exact stop
- 7.2.4 Tapping
- 7.2.5 Cutting pattern
- 7.2.6 Exact stop
- 7.2.7 Linear interpolation
- 7.2.8 Arc interpolation
- 7.2.9 Pause

7.2.10 Return to reference point

7.3 Feed function

7.3.1 Automatic acceleration and deceleration

7.3.2 Fast feed bell acceleration and deceleration

7.3.3 Linear acceleration and deceleration after cutting feed interpolation

7.3.4 Bell acceleration and deceleration after cutting feed interpolation

7.3.5 Feed rate

7.3.6 JOG ratio

7.4 Program input

7.4.1 Program name

7.4.2 Absolute/incremental instructions

7.4.3 Plane selection

7.4.4 Decimal Point input

7.4.5 Coordinate set

7.4.6 Automatic coordinate setting

7.4.7 Workpiece coordinate system

7.4.8 Presetting of workpiece coordinate system

7.4.9 Subroutine instruction calls

7.4.10 User Macros

7.4.11 Coordinate rotation

7.5 Spindle function

7.5.1 Spindle ratio

7.5.2 Spindle orientation

7.5.3 Rigid tapping

7.6 Tool compensation

7.6.1 tool length compensation

7.6.2 tool position compensation

7.6.3 tool diameter and tool tip radius compensation

7.7 Accuracy compensation

7.7.1 backlash compensation

7.7.2 rapid feed/cutting feed backlash compensation

7.7.3 Smooth reverse backlash compensation

7.7.4 Pitch error compensation

7.8 Setting / display

7.8.1 condition display

7.8.2 clock function

7.8.3 current position display

7.8.4 alarming information display

7.9 Others

7.9.1 build-in 10M/100M Ethernet interface

7.9.2 memory care input / output

7.9.3 USB input /output

8. Documentation

No	Name	Qty	Remarks
1	Operation manual of mechanical (Electronic documents only)	1set	Including hydraulic schematic diagram and maintaining diagram
2	Electric operation manual (Electronic documents only)	1set	Electrical diagram and interlink maintaining drawing
3	CNC system (Electronic documents only)	1pc	including operation manual, programming manual and diagnosis guide
4	Machine layout and foundation diagram	1pc	Provide separated
5	Packing list	1pc	Packed along with machine
6	Machine data and PLC back up	1set	Provide separated
7	Test chart	1set	

9. Main purchase parts

Name	Manufacturer	Remarks
Spindle bearing	NSK	
Ball screw rod	Chinese famous brand	
Ball screw rod bearing	NSK	
Roller bearing	SCHNEEBERGER	
Main hydraulic units	Chinese famous brand	
Central lubrication station	Chinese famous brand	
Pneumatic system	SMC	
Hydraulic station	Chinese famous brand	
Chip conveyor	Chinese famous brand	
Liner grating scales	Heidenhain	
Circular grating scales	Heidenhain	
CNC system and servo motor	FANUC 0i	

Note: Due to factors such as the procurement cycle, the manufacturer reserves the right to replace purchased parts of the same quality and different brands.

10. Machine paint

The paint color of the machine tool and accessories is according to the manufacturer's standard color:

10.1. The color of the lower bed of the machine is painted black and gray, and the paint number is RAL7021;

10.2. The other colors of the machine are painted red RAL3020, white RAL9003, and black RAL9004;

Remarks: The machine and accessories can be painted according to user requirements.

11. Option function and accessories

11.1. Option accessories

Optional items	User selection result (Tick <input type="checkbox"/> in the option bar)
1. Table increased to 1400×1600mm (Z=1300)	
2. Semi-protection for table	
3. ATC 40tools	
4.External coolant and chip conveyor	
5. FANUC 0i system ai series (spindle 2000rpm)	
6. SIEMENS 828D system (spindle 2000rpm)	

11.2. ATC (Optional)

Name	Specification
ATC capacity	40
Tool choose method	Accotding to ATC sequence No.
Tool max diameter/vicninty empty mm	125/250
Max length mm	400
Max weight of tool kg	25
Tool change time (point to point)s	20

